REMARKS

By the present amendment, claims 108-112 have been amended, and no claims have been cancelled or added. Accordingly, claims **1-23**, **25-62**, **64-82**, **85-99**, **101-103** and **105-112** are presently pending, and favorable reconsideration thereof is respectfully requested. Claims **1**, **4**, **14**, **31**, **35**, **40**, **43**, **53**, **70**, **74**, **80-82**, **85**, **89**, **95-98**, **102** and **107-112** are the independent claims. In view of the Examiner's objection in the Office Action mailed August 10, 2004 to the amendment format employed by the Applicant in the preceding Office Action response, Applicant has implemented the present amendment in the format requested by the Examiner in the August 10, 2004 Office Action.

Applicant wishes to thank the Examiner for the withdrawal of all previous grounds of rejection and objection. Applicant also wishes to thank the Examiner for the indication that claims 1-23, 25-62, 64-82, 85-96, 98, 99, 101-103 and 105-111 are allowable over the prior art of record.

<u>35 U.S.C. § 102(b): Claim 97</u>

The Examiner has rejected claim 97 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,101,431 to Niwa et al. ("Niwa").

Applicant respectfully submits that the Niwa reference fails to satisfy the requirements for a finding of anticipation of claim 97. In this regard, the standard for an anticipation rejection under 35 U.S.C. §102 has been well established by the Court of Appeals for the Federal Circuit, and is summarized in M.P.E.P. § 2131:

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California,* 2 U.S.P.Q. 2d 1051, 1053 (Fed. Cir. 1987). ... "The identical invention must be shown in as complete detail as is contained in the ... claim."

> *Richardson v. Suzuki Motor Co.,* 9 U.S.P.Q. 2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond,* 15 U.S.P.Q. 2d 1566, 1567 (Fed. Cir. 1990). ...

Independent claim 97 recites:

97. (Previously presented) A signal embodied in a computer-readable medium, the signal comprising:

> a first code segment for directing a processor circuit to cooperate with a detection system to continuously produce data in response to scattered portions of a laser pulse scattered by respective portions of said environment, during a measurement interval of sufficient duration to receive all said scattered portions, and
>
> a second code segment for directing said processor circuit to store said data.

Applicant respectfully submits that Niwa fails to disclose "directing a processor circuit to cooperate with a detection system to continuously produce data in response to scattered portions of a laser pulse scattered by respective portions of said environment, during a measurement interval of sufficient duration to receive all said scattered portions," as recited in claim 97. Applicant respectfully notes that these limitations of claim 97 provide numerous advantages over Niwa and the other prior art of record. For example, as noted in Applicant's specification (at page 8, lines 3-8, page 56, line 13 to page 61, line 19, and page 77, lines 17-28), this aspect of claim 97 allows a full set of laser data, rather than merely a first return value, to be obtained for each laser pulse. This may be particularly advantageous in light foliage conditions, for example, in which the obtained laser data may include not only a foliage height value, but also a ground height value, as well as one or more intermediate return values corresponding to objects such as foliage at intermediate heights between the foliage height and the ground height. Thus, for each laser beam pulse directed at the environment, the invention defined by claim 97 is capable of producing measurement values of the form (x, y, R_1, R_2, R_3, ... $R_{N,}$), where (x, y) are the latitude and longitude of the location of

the environment, and R_1, R_2, R_3, ... R_N represent various foliage heights ranging from the highest foliage height R_1 to the ground height R_N. An illustrative example of such multiple return values corresponding to multiple foliage layers (or other portions of the environment) at the same geographic location is shown in Figure 11 of Applicant's specification, for example.

Niwa discloses a flight system and system for forming virtual images for aircraft. It appears that the primary object of the Niwa system is to provide a pilot of a helicopter or similar rotor aircraft with artificially generated virtual images, which can be generated in real time, even if there is no visibility due to bad weather (col. 3, lines 34-44 and col. 6, lines 6-9). The virtual images are provided to the pilot on a helmet mounted display, but may also be presented on a heads up display (col. 8, lines 36-42). The Niwa system includes a first memory M1 for storing wide-area information, a second memory M2 for storing narrow-area information, and a third memory M3 for storing obstacle information (col. 9, lines 43-48). The wide-area information stored in the first memory M1 appears to be a digitized three-dimensional map previously derived from satellite-mounted cameras and aerial photographs (col. 10, lines 40-64), while the narrow-area information stored in the second memory M2 and the obstacle information stored in the third memory M3 are obtained using a "laser radar" 38, which appears to be an inaccurately translated term intended to describe a laser detection and ranging system employing an ultraviolet laser (col. 12 line 47) (a millimeter wave radar 39 may optionally be employed for this purpose as well: col. 5 lines 3-17). The narrow-area information stored in the second memory M2 is obtained in a database updating flight mode a3, by directing laser beams downward, while the obstacle information stored in the third memory M3 is obtained in a bad weather flight mode a2, by directing laser beams in a forward and horizontal direction (col. 11, lines 14-18; col. 12, lines 42-46; col. 14, lines 1-37).

However, to the extent that the Niwa system stores laser measurement values, Niwa appears to be an example of the prior art "first return" systems described in the Background section of Applicant's specification. In other

words, Niwa discloses only a single measurement point or data point resulting from each laser beam. In this regard, Niwa discloses that each of the second memory M2 and the third memory M3 stores a set of coordinates (x, y, z) in a rectangular coordinate system, wherein the x-axis and the y-axis correspond to latitude and longitude, while the z-axis corresponds to altitude (col. 9, lines 48-57; col. 6, lines 12-20). Thus, in the narrow-area information stored in the second memory M2, which has been obtained by pointing the laser beams downward during the database updating mode a3, Niwa discloses storing only a single altitude value (z) for each location defined by its latitude and longitude (x, y) to which a laser beam has been downwardly directed. Nowhere does Niwa disclose or suggest storing more than one altitude value (z) for a particular coordinate pair (x, y) obtained by pointing a laser beam downward to produce the narrow-area information.

Similarly, in connection with the bad weather mode a2, Niwa fails to disclose or suggest receiving anything more than a single first return value in connection with each forward location to which a laser beam is directed. In the resulting obstacle information stored in the third memory M3, Niwa again discloses storing only a single altitude value (z) for each latitude and longitude coordinate pair (x, y).

Thus, for each laser beam, Niwa only discloses producing data of the form (x, y, z) representing a single altitude value (z) for a given pair of latitude and longitude coordinates (x, y). Niwa fails to disclose or suggest more complete data of the form (x, y, R_1, R_2, R_3, ... R_N,) representing heights R_1, R_2, R_3, ... R_N of a plurality of respective portions of the environment at a given location (x, y) as disclosed in applicant's specification, and indeed, Niwa fails to appreciate the possibility that such data could be produced. Niwa therefore fails to disclose or suggest "a first code segment for directing a processor circuit to cooperate with a detection system to continuously produce data in response to scattered portions of a laser pulse scattered by respective portions of said environment, during a measurement interval of sufficient duration to receive all said scattered portions", as recited in claim 97.

Accordingly, the Niwa reference fails to satisfy the above-noted requirements for a finding of anticipation of claim 97. Applicant therefore respectfully requests that this ground of rejection be withdrawn.

35 U.S.C. § 102(b): Claim 112

The Examiner has rejected claim 112 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,018,306 to Serbin.

Applicant respectfully submits that the Serbin reference fails to satisfy the above-noted requirements for a finding of claim 112 as amended herein. In this regard, by the present amendment, claim 112 has been amended to recite:

112. (Currently amended) A signal embodied in a computer-readable medium, the signal comprising:

a first code segment for directing a processor circuit to receive data representing signals produced at an airborne receiver in response to a radar beam scattered by said environment; and

a second code segment for directing a processor circuit to apply a time domain migration algorithm to said data, to associate said data with particular locations of said environment.

Thus, claim 112 has been amended to recite that the migration algorithm applied to associate the data with particular locations of the environment is a time domain migration algorithm. Support for the foregoing amendment may be found at various locations in applicant's specification. For example, page 78, line 23 to page 81, line 15 of applicant's specification describes conversion of the time domain values (I, Q) into the frequency domain for various pre-processing steps, followed by conversion back to the time domain. Following further time domain pre-processing described at page 81, line 16 to page 82, line 25, the migration algorithm is then applied to the pre-processed time domain values (I, Q). Advantageously, the application of a "time-domain migration algorithm" as recited in amended claim 112 allows for

greater accuracy in the resulting surface and sub-surface profiles, as the application of the migration algorithm to time domain data avoids approximations (and hence errors) that tend to arise in frequency domain methods.

Serbin discloses a scalable range migration algorithm for high-resolution, large area SAR imaging. Generally, Serbin appears to be concerned with real-time implementation and more efficient processing (Abstract). Video phase history (VPH) data is input for processing, and corresponds to a two-dimensional array of complex-valued input data (col. 2, lines 10-27). Serbin discloses that the first processing step in the range migration algorithm is an along-track Fourier transform 12, which <u>converts the input VPH data 11 to wavenumber space</u> (col. 5, lines 20-26; col. 2, lines 14-16). The Fourier transform and a phase adjustment serve to provide all values of azimuth for a fixed value of range, while a global matrix transpose serves to provide all values of range for a fixed azimuth (col. 6, lines 60-67). Sub-band filtering and a sub-band phase adjustment produce a corrected phase history, which is then transformed by a Stolt interpolation into a linear function of the range wavenumber variable (col. 7, line 11 – col. 8, line 3). The resulting linearized phase history is subjected to a compression Fast Fourier Transform (FFT) to produce range pixels (col. 8, lines 23-25). A phase/gain equalization function is applied to the outputs of the compression FFT (col. 8, lines 32-39). A second global matrix transpose serves to produce all values of azimuth for a fixed value of range, and a further sub-band filtering step separates the entire patch width (in azimuth) into smaller azimuth sub-bands (col. 8, lines 46-65). A sub-band phase adjustment is then used to apply a correction to the outputs of the sub-band filtering step, following which an interpolation step establishes the final azimuth pixel spacing (col. 9, lines 32-50). The compression FFT produces azimuth pixels, and a phase/gain equalization function is applied to the outputs of the compression FFT. The resulting output image data from the range migration algorithm is shown in Fig. 9, with each ordered pair representing (azimuth, range) (col. 9, line 60 – col. 10, line 10).

Thus, as the first step in Serbin's range migration algorithm is an along-track Fourier transform 12 which converts the input VPH data 11 to wavenumber space (col. 5, lines 20-26), it appears that Serbin's migration algorithm is not a "time domain migration algorithm", as recited in amended claim 112. Rather, Serbin appears to disclose only a wavenumber domain migration algorithm, which, although potentially useful to Serbin in promoting his apparent goals of real-time implementation and more efficient processing, tends to lack the enhanced accuracy of the time domain migration algorithm recited in amended claim 112.

In summary, Serbin fails to disclose or suggest "a second code segment for directing a processor circuit to apply a time domain migration algorithm to said data, to associate said data with particular locations of said environment," as recited in amended claim 112, and therefore, Serbin fails to satisfy the above-noted test for anticipation. Applicant therefore respectfully submits that the rejection of claim 112 is overcome.

Conclusion

In view of the foregoing, Applicant respectfully submits that the present application is in condition for allowance, and respectfully requests that a Notice of Allowance be issued. In view of the significant number of Office Actions that have issued in the prosecution of the present application, should the Examiner have any outstanding concerns, the Examiner is respectfully requested to telephone the undersigned at the Examiner's earliest convenience, to expedite the allowance and issuance of the present application.

Respectfully submitted,

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